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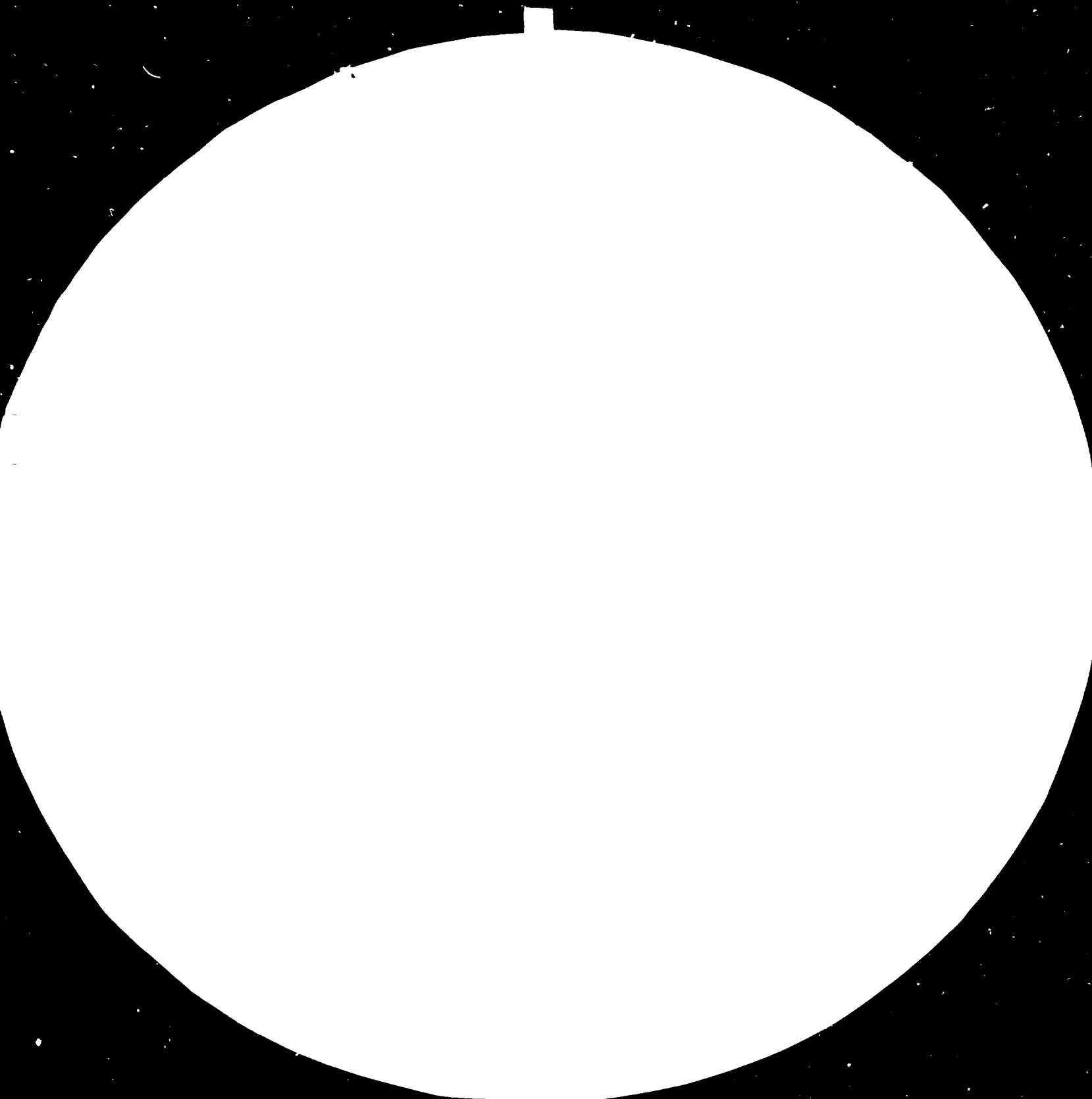

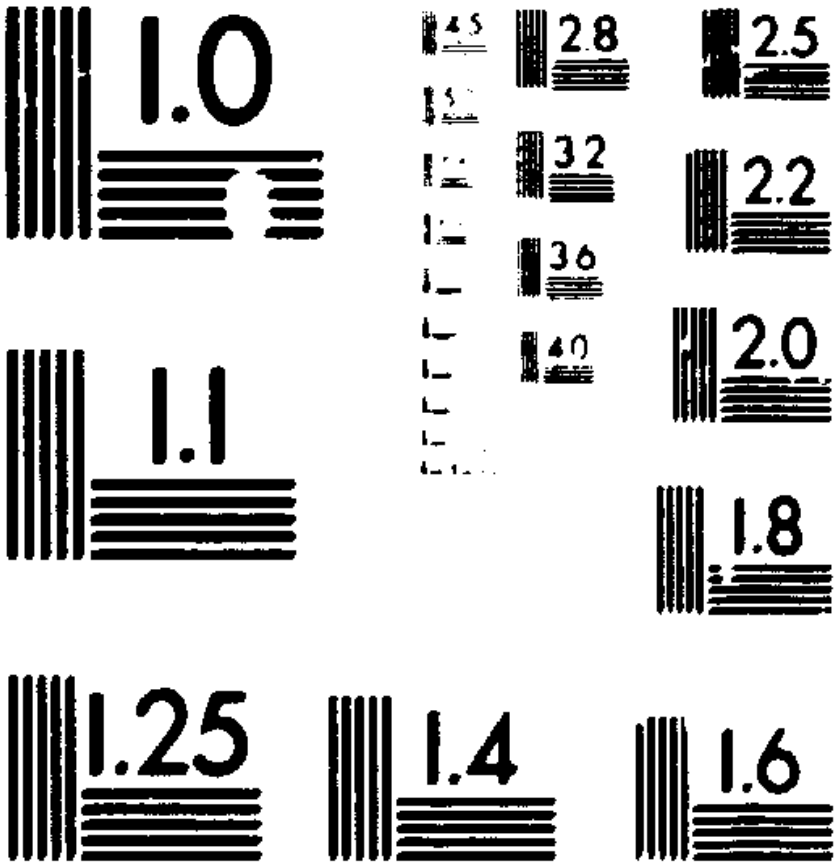

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# THE PRESENT SITUATION OF THE AGRICULTURAL MACHINERY INDUSTRY IN NORTH AMERICA AND WESTERN EUROPE

Sectoral Working Paper Series

No. 24

James Merchant

Sectoral Studies Branch
Division for Industrial Studies

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SECTORAL WORKING PAPERS

In the course of the work on major sectoral studies carried out by the UNIDO Division for Industrial Studies, several working papers are produced by the secretariat and by outside experts. Selected papers that are believed to be of interest to a wider audience are presented in the Sectoral Working Papers series. These papers are more exploratory and tentative than the sectoral studies. They are therefore subject to revision and modification before being incorporated into the sectoral studies.

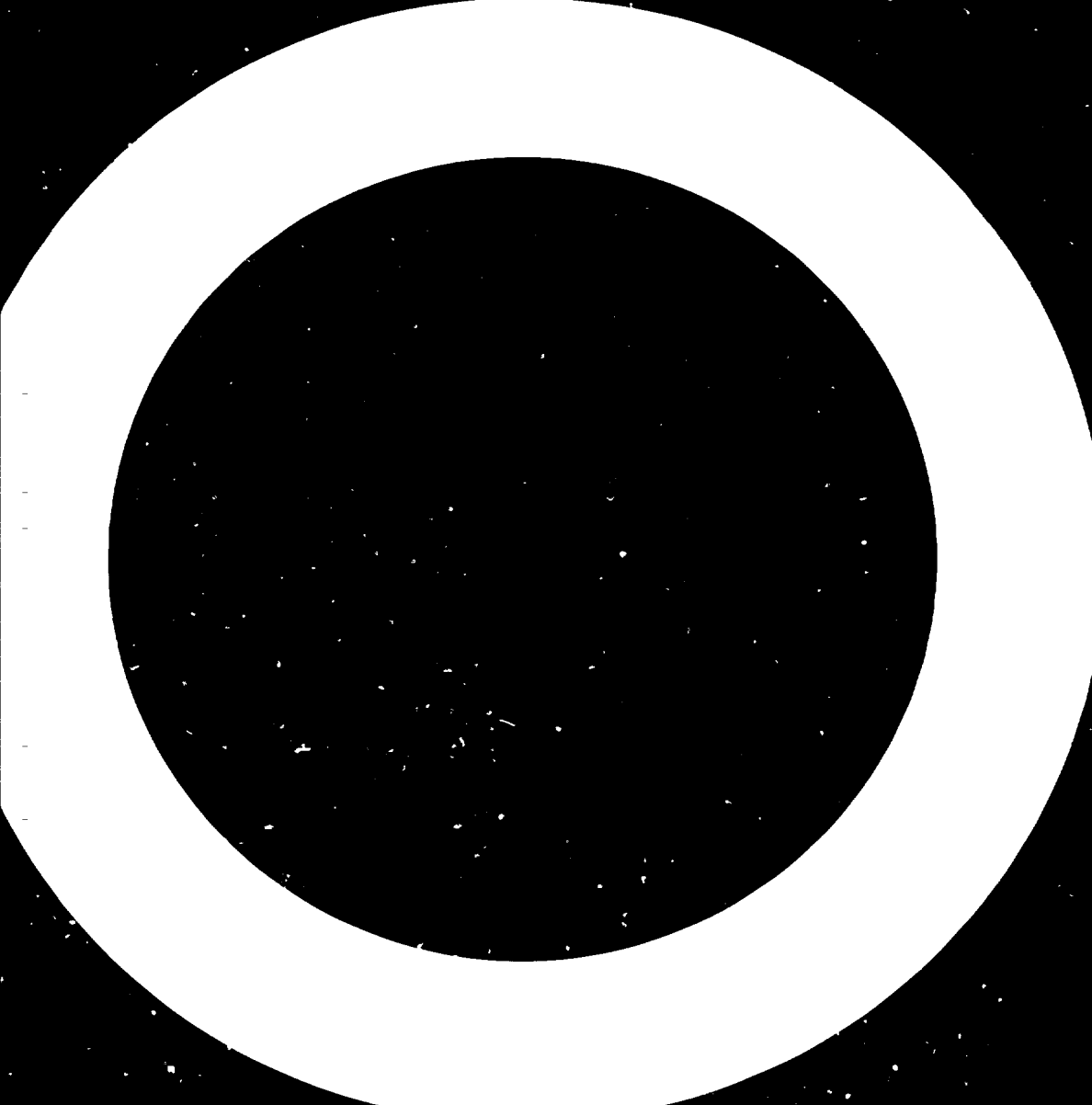


This paper was prepared by Messrs. James Merchant and David Dornbusch for North America and Messrs. Pascal Bye and Jean-Jacques Chanaron for Western Europe. The views expressed do not necessarily reflect the views of the UNIDO secretariat.

## Preface

As a part of the ongoing study work on the agricultural machinery sector the Sectoral Studies Branch of UNIDO's Division for Industrial Studies has commissioned two papers giving a general overview of the present status of the North American and Western European Agricultural Machinery Industry and a short-term market outlook. The main findings of these papers will ultimately be integrated into major studies of the agricultural machinery sector. However, it was believed that it would be of interest to present in advance the integral text of these consultancy papers, which are of a topical nature.

The paper on North America has been prepared by James Merchant and David Dornbusch (Dornbusch and Company). The paper on Western Europe has been prepared by Pascal Bye and Jean-Jacques Chanaron (University of Grenoble, France). The two papers have been put together into one, by the UNIDO secretariat. The views expressed are those of the consultants and do not necessarily reflect the views of the UNIDO secretariat. Tables without explicit indication of source have been elaborated by the consultants.



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References to dollars ($) are to United States dollars, unless otherwise stated.

A comma (,) is used to distinguish thousands and millions.

A full stop (.) is used to indicate decimals.

A slash between dates (e.g., 1980/81) indicates a crop year, financial year or academic year.

Use of a hyphen between dates (e.g., 1960-1965) indicates the full period involved, including the beginning and end years.

Metric tons have been used throughout.

The following forms have been used in tables:

Three dots (...) indicate that data is not available or is not separately reported.

A dash (-) indicates that the amount is nil or negligible.

A blank indicates that the item is not applicable.

Totals may not add up precisely because of rounding.

## 1. INTRODUCTION

North American agricultural machinery producers experienced another year of declining sales in 1983. Despite the decrease in sales, however, the industry as a whole reduced its losses in earnings in 1983. Early 1984 data indicate that sales have increased slightly in 1984 over 1983, and that the industry's earnings are continuing to increase. Most manufacturers were forced to cut costs substantially during the past four years to weather the sales decline. Costs were trimmed by decreasing manufacturer, but not dealer inventories, reducing employment, closing factories, prolonging shutdowns, restructuring divisions and selling subsidiaries. Although International Harvester's condition is still precarious, most firms in the industry appear to be stronger financially than one year ago. Any improved sales volume could restore profitability to most firms.

The 1980-1983 decline in agricultural machinery sales has been largely world-wide. International trade to and from the United States remains far below the 1979 level, although imports in 1983 gained 9 per cent over 1982. Low farm incomes resulting from low commodity prices are the primary reason for the world-wide drop in sales. Other reasons are also important in specific markets. Balance-of-payments difficulties in debtor nations have evoked hard currency restrictions that preclude machinery imports. High interest rates have made capital purchases relatively less appealing everywhere. The strength of the United States dollar disadvantages exports from United States factories, but improves profitability at subsidiary plants located outside the United States.

The outlook during 1984 is for improved sales of agricultural machinery, as industry sources expect sales gains in North America, South Africa, Australia and Latin American nations without severe balance-of-payment problems. Sales declines are forecast for Europe, Latin American debtor nations and the Middle-East.

The crisis on the European tractor and farm machinery market is part of a recession which has affected the whole of the world market since the mid-seventies. In Europe, the level of tractor sales has however been

stabilized since 1981 around 270,000 units, and thus still accounts for a third of world registrations, excluding the planned economies. This market therefore constitutes an important outlet for the major producers whose respective positions have changed considerably. The Italian constructors (Fiat and Same) have increased their penetration rate at the expense of North American transnationals (Massey Ferguson, International Harvester, Ford) whereas the French (Renault), German (Deutz, Fendt), Austrian (Steyr) and Finnish (Valmet) constructors have maintained their sales, benefitting from their implantation on their respective home markets.

This stabilization of sales on the European market should bring about a scenario of market sharing. The North American constructors would thus conserve the British market, and specialize their European plants in low and medium-range models to be exported towards the United States, Canada and Latin America, while John Deere will continue to occupy the high quality range. The European constructors should maintain their leading positions on their home markets, with comparison on the export market outside Western Europe for some of them. The Japanese constructors would thus progressively take over the bottom range by means of production and marketing agreements.

The market for other equipment are also in a state of crisis. Thus, the drop in sales of combined harvesters has accelerated since 1981, which has worsened the situation for the major producers. For draught equipment, the trends are less clear-cut although a downward tendency is general in the medium-term, as competition between constructors becomes more intense.

The hypothesis of a recovery of tractor and farm machinery sales in the near future seems unlikely, as long as the main depressive factors continue to operate: restrictions on milk and grain production, pressure on farmers' incomes, overstocking of farms in conventional machinery.

These conditions, the restructuring of the industrial apparatus (factory closures; reorganizations of services; regrouping but also implantation of new plants) among the major manufacturers, is accelerating. Technical, and more significantly, marketing agreements between specialized machinery manufacturers and tractor constructors are becoming more frequent, although it is not possible to talk of a renewal of the product range.

The progressive automation of the manufacturing process, at least among the major producers, seems to be tending to lower their costs and enhance their competitiveness on a world level.

The option of electronic modules, described as on-board electronics is intended to stimulate a sagging demand by improving the technical performance of present equipment.

Despite the fact that it is now threatened, the farm machinery industry remains more oriented towards marketing strategies than innovation strategies.

## 2. GENERAL OVERVIEW OF THE NORTH AMERICAN AGRICULTURAL MACHINERY SECTOR

### 2.1 Agricultural machinery sector data

The North American agricultural machinery sector is characterized by several large transnational firms producing a full range of tractors and implements and by a multitude of smaller, more specialized firms. The United States Department of Commerce estimates that the largest four firms account for 46 per cent of sector shipments.[1/] The largest firms typically produce machinery in the United States, Canada, one or more European countries, and one or more large developing countries such as Brazil or Argentina. Several large companies also maintain assembly plants in smaller developing countries.

Data on the agricultural machinery indstry in North America is primarily from two sources. Corporate Annual Reports provide company-specific sales and employment data as well as financial information. However, the Annual Reports typically do not differentiate production, employment and financial data according to where the production occurs or even between agricultural machinery production and production of other goods. Therefore, the information from Annual Reports generally contains data from several countries and from several product types. Tables 1 to 4 are based on Annual Report data from eight of the largest North American agricultural machinery producers, representing a majority of sector production. The remainder is shared by several hundred smaller companies.

The second major data source is United States Department of Commerce statistics. The Department of Commerce reports data on employment, shipments, prices and inventories for United States producers of agricultural machinery. Shipment data are reported for specific products and focus on domestic agricultural machinery. In contrast, employment and inventories are reported for the companies comprising the agricultural machinery sector and include

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1/ United States Department of Commerce. Bureau of Census. Current Industrial Report, MA-35A, "Farm Machinery and Lawn and Garden Equipment". 1982 and earlier.

data for non-agricultural machinery production, as well. Import and export data are reported on a product basis. The Department of Commerce does not report company-level data or industry financial data such as earnings.

## 2.2 Structural changes in the North American agricultural machinery industry

Table 1 reports the sales and profitability of eight major North American agricultural machinery manufacturers. The figures are expressed both in current dollars and in constant 1983 dollars. Table 1 shows industry sales peaking in nominal prices in 1981 and in real prices in 1979. Both measures demonstrate that sales in 1983 were more than 20 per cent lower than the already depressed 1982 level. In real terms, 1983 sales were less than half of these in 1979. The industry turned from profitability to losses in 1980, even excluding Ford's losses which were largely due to its automobile manufacturing. Over the past three years, seven of the eight manufacturers have reported losses - massive losses for three of the eight.

Despite declining sales, the industry as a whole reduced its losses in 1983. Ford Motor's company-wide profits dominated the industry's earnings, but five of the other seven companies either reduced their losses or showed a profit. So far in 1984 the industry is continuing this turnaround. Even excluding Ford Motor's profits, the industry's earnings are almost back to break-even after four years of heavy losses.

Table 2 focuses on the year-to-year changes in sales and profits. It shows clearly the extraordinary turnaround in profitability in 1983. With sales continuing to drop in 1983, real profits increased (or losses decreased) by an aggregate of over $US 4 billion. Even excluding Ford Motor, whose earnings are dominated by automobile production, industry profitability increased over $US 1.6 billion. The early 1984 data show modest sales gains (the first since 1979) and additional large profit increases.

Table 1. World-wide sales and profits, eight North American agricultural machinery producers (millions of $US)

| Company name | Annual sales and profits | | | | | | | | | | | | Most recent period | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | | 1983 | | 1983 | | 1984 | | |
| | a | b | a | b | a | b | a | b | a | b | a | b | a | b | a | b | i/ |
| **Allis-Chalmers** | | | | | | | | | | | | | | | | | |
| Sales c/ | 796 | 1,219 | 957 | 1,345 | 939 | 1,182 | 924 | 1,046 | 603 | 632 | 512 | 512 | n.a. | n.a. | n.a. | n.a. | H |
| Profits | 89 | 136 | 114 | 160 | 73 | 92 | -3 | -3 | -152 | -159 | -36 | -36 | -93 | -93 | -28 | -27 | |
| **J.I. Case** | | | | | | | | | | | | | | | | | |
| Sales d/ | 1,386 | 2,122 | 1,674 | 2,353 | 1,671 | 2,104 | 1,798 | 2,035 | 1,458 | 1,529 | 1,412 | 1,412 | n.a. | n.a. | n.a. | n.a. | n.a. |
| Profits | 41 | 63 | 37 | 52 | 0 | 0 | 19 | 22 | -3 | -3 | -56 | -56 | n.a. | n.a. | n.a. | n.a. | |
| **John Deere** | | | | | | | | | | | | | | | | | |
| Sales e/ | 3,297 | 5,048 | 3,936 | 5,533 | 4,489 | 5,651 | 4,665 | 5,280 | 4,033 | 4,230 | 3,314 | 3,314 | 1,621 | 1,621 | 1,709 | 1,654 | H |
| Profits | 265 | 406 | 311 | 437 | 228 | 287 | 251 | 284 | 53 | 56 | 23 | 23 | 82 | 82 | 6 | 6 | |
| **Ford Motor** | | | | | | | | | | | | | | | | | |
| Sales e/ f/ | 979 | 1,499 | 1,496 | 2,103 | 1,222 | 1,538 | 1,280 | 1,449 | 1,097 | 1,151 | 1,010 | 1,010 | 173 | 173 | 261 | 253 | Q |
| Profits | 1,589 | 2,433 | 1,169 | 1,643 | -1,543 | -1,942 | -1,060 | -1,200 | -658 | -690 | 1,867 | 1,867 | 211 | 211 | 897 | 868 | |
| **Hesston** | | | | | | | | | | | | | | | | | |
| Sales | 166 | 254 | 229 | 322 | 241 | 303 | 280 | 317 | 254 | 266 | 254 | 254 | 101 | 101 | 106 | 103 | H |
| Profits | -4 | -6 | 6 | 8 | 1 | 1 | 4 | 5 | -8 | -8 | 2 | 2 | 2 | 2 | 3 | 3 | |
| **International Harvester** | | | | | | | | | | | | | | | | | |
| Sales e/ g/ | 2,348 | 3,595 | 3,069 | 4,315 | 2,507 | 3,156 | 2,280 | 3,373 | 1,864 | 1,955 | 1,349 | 1,349 | 662 | 662 | 717 | 694 | H |
| Profits | 187 | 286 | 427 | 600 | -297 | -374 | -351 | -397 | -1,738 | -1,823 | -485 | -485 | -270 | -270 | -56 | -54 | |
| **Massey-Ferguson** | | | | | | | | | | | | | | | | | |
| Sales | 2,631 | 4,029 | 2,973 | 4,180 | 3,132 | 3,943 | 2,646 | 2,995 | 2,058 | 2,159 | 1,535 | 1,535 | 403 | 403 | 365 | 353 | Q |
| Profits | -262 | -401 | 37 | 52 | -225 | -283 | -195 | -221 | -413 | -433 | -68 | -68 | 18 | -18 | 2 | 2 | |
| **Sperry-New Holland** | | | | | | | | | | | | | | | | | |
| Sales h/ | 752 | 1,151 | 876 | 1,232 | 1,039 | 1,308 | 1,087 | 1,230 | 1,013 | 1,062 | 706 | 706 | 706 | 706 | 729 | 706 | Y |
| Profits | 109 | 167 | 127 | 179 | 138 | 174 | 117 | 132 | 69 | 72 | -30 | -30 | -30 | -30 | 43 | 42 | |
| **Total** | | | | | | | | | | | | | | | | | |
| Sales | 12,355 | 18,918 | 15,210 | 21,383 | 15,240 | 19,185 | 15,660 | 17,724 | 12,380 | 12,985 | 10,092 | 10,092 | 3,666 | 3,666 | 3,887 | 3,763 | |
| Profits | 2,014 | 3,084 | 2,228 | 3,132 | -1,625 | -2,046 | -1,218 | -1,379 | -2,850 | -2,989 | 1,217 | 1,217 | -280 | -280 | 867 | 839 | |

(a) Current prices.
(b) 1983 prices.

c/ Sales and profits pertain only to agricultural machinery and materials handling equipment.
d/ Sales and profits pertain only to agricultural and construction machinery.
e/ Sales pertain only to agricultural machinery; profits are company-wide.
f/ Sales are estimated by multiplying unit tractor sales by $US 15,000 (1982 prices).
g/ Prior earnings restated in 1983.
h/ Sales and profits pertain only to agricultural machinery; operating profits are before interest on company-wide debt.
i/ Q: quarter; H: half; Y: year-end; n.a.: not available.

Table 2. Annual change in sales and profitability, eight North American agricultural machinery producers (millions of 1983 $US)

| Company name | | Annual changes | | | | | Comparable periods |
|---|---|---|---|---|---|---|---|
| | | 1978-79 | 1979-80 | 1980-81 | 1981-82 | 1982-83 | 1983-84 |
| Allis-Chalmers | Change in sales | 127 | -163 | -136 | -413 | -120 | n.a. |
| | Change in profits | 24 | -68 | -95 | -156 | 123 | 66 |
| J.I. Case | Change in sales | 231 | -250 | -69 | -506 | -117 | n.a. |
| | Change in profits | -11 | -52 | 22 | -25 | -53 | n.a. |
| John Deere | Change in sales | 485 | 118 | -371 | -1,050 | -916 | 33 |
| | Change in profits | 31 | -150 | -3 | -228 | -33 | 88 |
| Ford Motor | Change in sales | 604 | -565 | -90 | -258 | -91 | 80 |
| | Change in profits | -790 | -3,586 | 743 | 510 | 2,557 | 657 |
| Hesston | Change in sales | 68 | -19 | 14 | -50 | -12 | 2 |
| | Change in profits | 15 | -7 | 3 | -13 | 10 | 1 |
| International Harvester | Change in sales | 719 | -1,159 | 217 | -1,418 | -606 | 32 |
| | Change in profits | 314 | -974 | -23 | -1,426 | 1,338 | 216 |
| Massey-Ferguson | Change in sales | 151 | -237 | -948 | -836 | -624 | -50 |
| | Change in profits | 453 | -335 | 63 | -212 | 365 | 20 |
| Sperry-New Holland | Change in sales | 80 | 76 | -78 | -168 | -356 | 0 |
| | Change in profits | 12 | -5 | -41 | -60 | -102 | 72 |
| Total | Change in sales | 2,465 | -2,198 | -1,461 | -4,739 | -2,844 | 96 |
| | Change in profits | 48 | -5,178 | 667 | -1,611 | 4,206 | 1,119 |
| Total less Ford Motor | Change in sales | 1,861 | -1,633 | -1,372 | -4,441 | -2,752 | 17 |
| | Change in profits | 838 | -1,592 | -76 | -2,120 | 1,649 | 462 |

Source: Data from table 1.

Even International Harvester has accomplished a turnaround. It reduced its losses by $US 1.3 billion in 1983, and by a further $US 200 million in the first half of 1984. The company's problems persist, however, with recent losses reducing stockholders' equity to minus $US 450 million.[2/]

The sales and profitability data indicate an important structural change in the industry. The restructuring and cost cutting achieved by major manufacturers have decreased the break-even level of production to far below its former level, in Massey-Ferguson's case to half its 1977 level. The manufacturers appear to have greatly improved their operational efficiency and are poised to further improve their earnings when sales increase.

Table 3 contains manufacturers' and dealers' inventories for six North American agricultural machinery producers. Ford Motor and Allis-Chalmers are omitted because their agricultural machinery production constitutes less than 50 per cent of their total business and inventory data are not reported separately. Table 3 shows that dealer inventories have remained steady in real terms, even in the face of declining sales. In contrast, manufacturers have been drastically cutting inventories. In real terms, manufacturers' inventories at the end of 1983 stood at 31 per cent of 1979 year-end inventories. Some of this inventory reduction has been achieved by selling off divisions or production facilities (International Harvester and Massey-Ferguson), but all producers have substantially reduced their inventories.

So far in 1984, manufacturer inventories have declined further, more than offsetting the slight rise in dealer inventories. The decline in inventories may finally be over, as manufacturers have largely completed their restructuring plans and as sales have probably stopped falling.

Table 4 shows that world-wide employment for five North American agricultural machinery producers has now fallen by half since 1979. International Harvester and Massey-Ferguson have each curtailed employment by

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2/ International Harvester Company, Annual Reports, 1982 and 1983, Chicago, IL.

Table 3. Manufacturers' and dealers' inventories, five North American agricultural machinery producers (millions of $US)

| Company name | | Year-end | | | | | Most recent period | |
|---|---|---|---|---|---|---|---|---|
| | | 1979 | 1980 | 1981 | 1982 | 1983 | 1983 | 1984 |
| J.I. Case | Mfr. inventory a/ | 570 | 524 | 437 | 425 | 424 | n.a. | n.a. |
| | Dealer inventory b/ | 519 | 660 | 955 | 882 | 916 | n.a. | n.a. |
| | Total inventory c/ | 1,089 | 1,184 | 1,392 | 1,307 | 1,340 | n.a. | n.a. |
| | Total inventory d/ | 1,531 | 1,491 | 1,575 | 1,371 | 1,340 | n.a. | n.a. |
| John Deere | Mfr. inventory | 886 | 877 | 872 | 761 | 632 | 705 | 737 |
| | Dealer inventory | 1,402 | 2,093 | 2,374 | 2,661 | 2,717 | 2,952 | 3,049 |
| | Total inventory c/ | 2,288 | 2,970 | 3,246 | 3,422 | 3,349 | 3,657 | 3,786 |
| | Total inventory d/ | 3,217 | 3,739 | 3,674 | 3,589 | 3,349 | 3,657 | 3,664 |
| Hesston | Mfr. inventory | 87 | 96 | 87 | 59 | 48 | n.a. | n.a. |
| | Dealer inventory | 82 | 99 | 113 | 153 | 178 | n.a. | n.a. |
| | Total inventory c/ | 169 | 195 | 200 | 212 | 226 | n.a. | n.a. |
| | Total inventory d/ | 238 | 245 | 226 | 222 | 226 | n.a. | n.a. |
| International Harvester | Mfr. inventory a/ | 2,455 | 2,567 | 1,846 | 759 | 619 | 744 | 728 |
| | Dealer inventory | 806 | 769 | 555 | 305 | 255 | 277 | 267 |
| | Total inventory c/ | 3,261 | 3,336 | 2,401 | 1,064 | 874 | 1,021 | 995 |
| | Total inventory d/ | 4,585 | 4,200 | 2,717 | 1,116 | 874 | 1,021 | 963 |
| Massey-Ferguson | Mfr. inventory | 1,098 | 989 | 747 | 626 | 483 | 577 | 539 |
| | Dealer inventory | 673 | 875 | 835 | 627 | 484 | 538 | 507 |
| | Total inventory c/ | 1,771 | 1,864 | 1,582 | 1,253 | 967 | 1,115 | 1,046 |
| | Total inventory d/ | 2,490 | 2,347 | 1,791 | 1,314 | 967 | 1,115 | 1,012 |
| Total | Mfr. inventory | 5,096 | 5,053 | 3,989 | 2,630 | 2,206 | 2,026 | 2,004 |
| | Dealer inventory | 3,482 | 4,496 | 4,832 | 4,628 | 4,550 | 3,767 | 3,823 |
| | Total inventory c/ | 8,578 | 9,549 | 8,821 | 7,258 | 6,756 | 5,793 | 5,827 |
| | Total inventory d/ | 12,059 | 12,021 | 9,984 | 7,613 | 6,756 | 5,793 | 5,639 |

a/ Prior years' inventories restated in 1983.
b/ Dealer inventories for all manufacturers are estimated from trade receivables shown on financial statements.
c/ Current prices.
d/ 1983 prices.

over 60 per cent since 1979. Heston, John Deere, and J.I. Case have reduced employment by 46, 30 and 23 per cent, respectively. Employment, like inventories, may be at a nadir now that manufacturers have retrenched and sales have bottomed.

Table 4. World-wide employment, five North American agricultural machinery producers

| Company name | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| J.I. Case | 16,325 | 17,275 | 14,725 | 13,875 | 15,050 | 13,300 |
| John Deere | 59,208 | 65,392 | 61,039 | 60,857 | 48,372 | 45,728 |
| Hesston | 3,084 | 3,333 | 3,275 | 3,077 | 2,595 | 1,785 |
| International Harvester a/ | 95,450 | 97,660 | 87,162 | 65,640 | 43,290 | 32,445 |
| Massey-Ferguson | 58,000 | 56,200 | 41,700 | 39,789 | 29,749 | 23,751 |
| Total | 232,067 | 239,860 | 207,901 | 183,238 | 139,056 | 117,009 |

a/ Includes employment in truck manufacturing, which comprised 63 per cent of sales in 1983.

Table 5 is comprised of United States Department of Commerce data pertaining to United States agricultural machinery producers - Standard Industrial Classification (SIC) Code 352. These data focus only on United States production, so it does not include data for Massey-Ferguson and for Canadian and other foreign production by United States manufacturers. The first three row pairs are product shipments specifically including only tractors and other agricultural machinery. The fourth row pair is sector shipments that include goods and services other than agricultural machinery produced by the agricultural machinery sector. Lawn and garden equipment, for example, would be excluded from the first three row pairs, but could be included in the fourth row pair if it were produced by an agricultural machinery manufacturer. Table 4 shows that the industry peaked in real terms

Table 5. Sector shipments and employment, United States agricultural machinery producers (SIC 352) (millions of $US)

| Category | | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | January - May 1983 | January - May 1984 |
|---|---|---|---|---|---|---|---|---|---|
| Farm tractors a/ | Current prices | 2,264 | 2,902 | 2,761 | 3,066 | 2,215 | 1,721 | 662 | 1,142 |
| | 1983 prices f/ | 3,467 | 4,080 | 3,476 | 3,470 | 2,323 | 1,721 | 662 | 1,119 |
| Farm machinery except tractors b/ | Current prices | 5,479 | 6,711 | 6,651 | 6,937 | 5,542 | 5,026 | 2,275 | 1,998 |
| | 1983 prices | 8,389 | 9,435 | 8,373 | 7,851 | 5,813 | 5,026 | 2,275 | 1,958 |
| Total farm machinery shipments c/ | Current prices | 7,743 | 9,613 | 9,412 | 10,003 | 7,757 | 6,747 | 2,937 | 3,140 |
| | 1983 prices | 11,856 | 13,515 | 11,849 | 11,321 | 8,136 | 6,747 | 2,937 | 3,078 |
| Total sector shipments d/ | Current prices | 11,935 | 15,535 | 15,092 | 15,954 | 11,788 | 10,622 | 4,624 | 4,943 |
| | 1983 prices | 18,276 | 21,840 | 18,999 | 18,057 | 12,364 | 10,622 | 4,624 | 4,845 |
| Sector employment e/ | | 120,900 | 143,100 | 142,300 | 149,900 | 118,400 | 102,400 | n.a. | n.a. |

a/ Wheeled tractors for agricultural use.
b/ Excludes lawn and garden equipment and commercial turf equipment. Data for 1983 and early 1984 derived by subtracting tractor shipments from total farm machinery shipments.
c/ Sum of previous two lines. Data for 1983 and 1984 estimated as a per cent of total sector shipments.
d/ Includes all goods and services produced by the farm machinery sector (SIC 352).
e/ Scaled to match sector shipments shown in this table.
f/ U.S. Bureau of Labor Statistics Producer Price Index for Agricultural Machinery.

in 1979, then drifted downward in 1980 and 1981, with nominal shipments increasing but real shipments declining. Real industry shipments declined 30 per cent in 1982, followed in 1983 by another 15 per cent decrease.

During the first five months of 1984 real sector shipments are up 5 per cent over the comparable period in 1983. This gain is due entirely to increases in tractor sales, which are up 70 per cent over last year.

Table 6 details the size breakdown ot tractor shipments by United States manufacturers. Although between 1979 and 1983 totcl real tractor shipments declined by 58 per cent, the per cent drop differed by tractor size. Shipments of tractors under 100 HP fell by 77 per cent between 1979 and 1983, while shipments of tractors of over 100 HP fell by 52 per cent. These figures document the shift in small and medium tractor production from North American factories to foreign factories, either subsidiaries or independent companies.

## 2.3 International trade

Table 7 contains United States shipment data for fifteen categories of agricultural machinery other than tractors. Real shipments in 1982 were 26 per cent below those in 1981. The decline from the 1978-1980 peak is almost uniform: sales in every category are down at least 25 per cent from their peak. No subsector has avoided the drop in sales, and presumably no smaller company operating in one product type has been spared the sector-wide downturn.

United States' imports of agricultural machinery are shown in table 8. Real imports peaked in 1979, the same year as domestic shipments. Imports in 1982 were 55 per cent of the 1979 peak. In 1983 imports rose 9 per cent despite a 14 per cent decline in domestic shipments. The 1983 gains were mostly in small and medium tractors.

Table 9 shows United States agricultural machinery exports. In real terms, exports peaked in 1981, two years after the domestic peak. Exports dropped 29 per cent in 1982 and an additional 32 per cent in 1983. Exports in each machine category have dropped a total of about 50 per cent from the

Table 6. Detailed breakdown of wheeled farm tractor shipments, United States agricultural machinery producers (SIC 352) (million of $US)

| Category | | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|---|
| **Tractors** | | | | | | | |
| Under 60 HP a/ | Current prices | b/ | b/ | b/ | 210 | 102 | b/ |
| | 1983 prices | b/ | b/ | b/ | 238 | 107 | b/ |
| 60 to 79 HP | Current prices | 347 | 492 | 385 | 144 | 94 | b/ |
| | 1983 prices | 531 | 692 | 485 | 163 | 99 | b/ |
| 80 to 99 HP | Current prices | 183 | 150 | 149 | 215 | 103 | 204 |
| | 1983 prices | 280 | 211 | 188 | 243 | 108 | 204 |
| 100 to 119 HP | Current prices | 295 | 335 | 264 | 356 | 219 | 164 |
| | 1983 prices | 452 | 471 | 332 | 403 | 230 | 164 |
| 120 to 139 HP | Current prices | 575 | 629 | 659 | 753 | b/ | 593 |
| | 1983 prices | 880 | 884 | 830 | 852 | b/ | 593 |
| 140 to 159 HP | Current prices | 308 | 335 | 286 | 327 | 769 | b/ |
| | 1983 prices | 472 | 471 | 360 | 370 | 807 | b/ |
| 1960 to 179 HP | Current prices | b/ | b/ | 125 | 208 | 136 | 248 |
| | 1983 prices | b/ | b/ | 157 | 235 | 143 | 247 |
| 180 HP and over | Current prices | 211 | 345 | 205 | 222 | 248 | 163 |
| | 1983 prices | 323 | 482 | 258 | 251 | 260 | 168 |
| 4-wheel drive | Current prices | 346 | 619 | 689 | 632 | 544 | 345 |
| | 1983 prices | 530 | 870 | 867 | 715 | 571 | 345 |
| Total wheeled farm tractors | Current prices | 2,265 | 2,903 | 2,762 | 3,067 | 2,215 | 1,721 |
| | 1983 prices | 3,468 | 4,081 | 3,477 | 3,471 | 2,323 | 1,721 |

a/ HP = horsepower: United states unit of power equivealent to 746 watts.
b/ Data for this size category were not reported separately but combined with the next larger size.

Table 7. Detailed breakdown of agricultural machinery shipments, United States agricultural machinery producers (SIC 352) (millions of $US)

| Machinery category | | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|---|
| Planting, seeding and fertilizing | Current prices | 522 | 653 | 681 | 802 | 661 |
| | 1983 prices | 799 | 918 | 857 | 908 | 693 |
| Harrows, rollers, stalk cutters and pulverizers | Current prices | 462 | 601 | 555 | 522 | 349 |
| | 1983 prices | 707 | 845 | 699 | 591 | 366 |
| Plows | Current prices | 204 | 273 | 246 | 233 | 152 |
| | 1983 prices | 312 | 384 | 310 | 264 | 159 |
| Harvesting | Current prices | 1,816 | 2,134 | 2,207 | 2,580 | 2,137 |
| | 1983 prices | 2,781 | 3,000 | 2,778 | 2,920 | 2,241 |
| Haying | Current prices | 534 | 675 | 778 | 712 | 545 |
| | 1983 prices | 818 | 949 | 979 | 806 | 572 |
| Farm dairy | Current prices | 109 | 134 | 144 | 160 | 109 |
| | 1983 prices | 167 | 188 | 181 | 181 | 114 |
| Sprayers and dusters | Current prices | 198 | 245 | 254 | 248 | 250 |
| | 1983 prices | 303 | 344 | 320 | 281 | 262 |
| Farm elevators and blowers | Current prices | 157 | 173 | 141 | 118 | 114 |
| | 1873 prices | 240 | 243 | 178 | 134 | 120 |
| Cultivators and weeders | Current prices | 206 | 276 | 276 | 236 | 201 |
| | 1983 prices | 315 | 388 | 347 | 267 | 211 |
| Crop preparation | Current prices | 356 | 385 | 340 | 319 | 276 |
| | 1983 prices | 545 | 541 | 428 | 361 | 289 |
| Farm poultry equipment | Current prices | 159 | 223 | 175 | 145 | 103 |
| | 1983 prices | 243 | 314 | 220 | 164 | 108 |
| Hog equipment | Current prices | 95 | 121 | 64 | 42 | 38 |
| | 1983 prices | 145 | 170 | 81 | 48 | 40 |
| Other barn and barnyard equipment | Current prices | 252 | 307 | 274 | 257 | 199 |
| | 1983 prices | 386 | 432 | 345 | 291 | 209 |
| Farm wagons and other transportation equipment | Current prices | 248 | 277 | 207 | 212 | 155 |
| | 1983 prices | 380 | 389 | 261 | 240 | 163 |
| Irrigation systems | Current prices | 161 | 234 | 309 | 349 | 253 |
| | 1983 prices | 247 | 329 | 389 | 395 | 265 |
| Total farm machinery except tractors | Current prices | 5,479 | 6,711 | 6,651 | 6,935 | 5,542 |
| | 1983 prices | 8,389 | 9,435 | 8,373 | 7,849 | 5,813 |

Table 8. International agricultural machinery trade, imports into the United States (millions of $US)

| Machinery Category | | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|---|
| Tractors | | | | | | | |
| Less than 40 HP | Current prices | 128 | 205 | 146 | 155 | 129 | 166 |
| | 1983 prices | 196 | 288 | 184 | 175 | 135 | 166 |
| 40 to 99 HP | Current prices | 91 | 271 | 323 | 241 | 200 | 330 |
| | 1983 prices | 139 | 381 | 407 | 273 | 210 | 330 |
| 100 HP or more | Current prices | 40 | 52 | 65 | 56 | 57 | 52 |
| | 1983 prices | 61 | 73 | 82 | 63 | 60 | 52 |
| Used or HP unspecified | Current prices | 212 | 144 | 130 | 160 | 142 | 139 |
| | 1983 prices | 325 | 202 | 164 | 181 | 149 | 139 |
| Tractors Total | Current prices | 471 | 672 | 664 | 612 | 528 | 687 |
| | 1983 prices | 721 | 945 | 836 | 693 | 554 | 687 |
| Machinery | | | | | | | |
| Soil preparation and cultivation | Current prices | 97 | 125 | 132 | 129 | 89 | 83 |
| | 1983 prices | 149 | 176 | 166 | 146 | 93 | 83 |
| Harvesting | Current prices | 330 | 471 | 467 | 416 | 322 | 295 |
| | 1983 prices | 505 | 662 | 588 | 471 | 338 | 295 |
| Dairy and other | Current prices | 63 | 103 | 86 | 95 | 74 | 97 |
| | 1983 prices | 96 | 145 | 108 | 108 | 78 | 97 |
| Machinery Total | Current prices | 490 | 699 | 685 | 640 | 485 | 475 |
| | 1983 prices | 750 | 983 | 862 | 724 | 509 | 475 |
| Total tractors and other agricultural machinery | Current prices | 961 | 1,371 | 1,349 | 1,252 | 1,013 | 1,162 |
| | 1983 prices | 1,471 | 1,927 | 1,698 | 1,417 | 1,062 | 1,162 |

Source: US Department of Commerce - US General Imports and Imports for Consumption - Schedule A: Commodity by Country - FT-135, December 1983 and earlier.

Table 9. International agricultural machinery trade, United States' exports (millions of $US)

| Machinery Category | | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|---|
| Tractors | | | | | | | |
| Less than 40 HP | Current prices | 15 | 22 | 18 | 14 | 6 | 3 |
| | 1983 prices | 23 | 31 | 23 | 16 | 6 | 3 |
| 40 to 99 HP | Current prices | 87 | 69 | 59 | 79 | 45 | 30 |
| | 1983 prices | 133 | 97 | 74 | 89 | 47 | 30 |
| 100 HP or more | Current prices | 322 | 407 | 498 | 623 | 495 | 346 |
| | 1983 prices | 493 | 572 | 627 | 705 | 519 | 346 |
| Used or HP unspecified | Current prices | 119 | 158 | 160 | 184 | 93 | 51 |
| | 1983 prices | 182 | 222 | 201 | 208 | 98 | 51 |
| Tractors Total | Current prices | 543 | 656 | 735 | 900 | 639 | 430 |
| | 1983 prices | 831 | 922 | 925 | 1,019 | 670 | 430 |
| Machinery | | | | | | | |
| Soil preparation and cultivation | Current prices | 210 | 262 | 262 | 299 | 218 | 185 |
| | 1983 prices | 322 | 368 | 330 | 338 | 229 | 185 |
| Harvesting | Current prices | 497 | 645 | 846 | 909 | 744 | 513 |
| | 1983 prices | 761 | 907 | 1,065 | 1,029 | 780 | 513 |
| Dairy and other | Current prices | 138 | 181 | 187 | 212 | 165 | 133 |
| | 1983 prices | 211 | 254 | 235 | 240 | 173 | 133 |
| Machinery Total | Current prices | 845 | 1,088 | 1,295 | 1,420 | 1,127 | 831 |
| | 1983 prices | 1,294 | 1,530 | 1,630 | 1,607 | 1,182 | 831 |
| Total tractors and other agricultural machinery | Current prices | 1,388 | 1,744 | 2,030 | 2,320 | 1,766 | 1,261 |
| | 1983 prices | 2,125 | 2,452 | 2,556 | 2,626 | 1,852 | 1,261 |

Source: US Department of Commerce - US Exports - Schedule E: Commodity by Country. FT - 410, December 1983 and earlier.

1979/1981 peak, with the exception of small (under 40 HP) and medium (40 to 99 HP) tractors. They have declined 90 per cent and 77 per cent, respectively, reflecting the fact that United States producers have stopped making smaller tractors in the United States and have shifted production of medium tractors to their European subsidiaries.

## 2.4 Short-term outlook

World-wide sales of agricultural tractors and combines in 1983 were 5 per cent and 12 per cent, respectively, below the depressed levels of 1982.[3/] In 1984, the underlying market conditions appear to be improved, with commodity prices and farm incomes expected to be higher than last year. However, farm incomes and other factors such as currency controls vary substantially by market area.

North America: with many farmers having deferred purchases of new farm machinery since 1981, pent-up demand has grown.[4/] Higher grain prices and acreage increases following the Payment in Kind Programme should help increase sales in 1984. However, the uncertain future of still high interest rates, will still constrain capital expenditures such as for farm machinery purchases to moderate increases over 1983.

A March 1984 survey of farm machinery manufacturers by the Farm and Industrial Equipment Institute (FIEI) showed that the industry expects a 5 to 10 per cent increase in 1984 United States retail sales of most farm equipment. The respondents expect substantial gains in larger tractors (100 HP or over, or 4 wheel-drive), combines, cornheads and windrowers, with small balers the only category expected to decrease in sales. These survey results are shown in table 10.

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3/ Massey-Ferguson Limited. Annual Reports, 1982 and 1983, Toronto, Canada.

4/ United States Department of Commerce. United States Industrial Outlook 1984. Chapter 23, "Special Industrial Machinery, Farm Machinery". January 1984.

Table 10. Industry forecasts of United States agricultural machinery sales (per cent change from previous year)

| Category | Industry forecast 1984 | 1985 |
|---|---|---|
| All field equipment | 8.0 | n.a. |
| All farm tractors | 6.7 | 5.5 |
| 2WD tractors, under 40 HP | 2.5 | 3.2 |
| 2WD tractors, 40 to 99 HP | 7.6 | 7.3 |
| 2WD tractors, 100 HP and over | 10.1 | 6.4 |
| 4WD tractors | 17.7 | 6.7 |
| Self-propelled combines | 25.4 | 5.0 |
| Cornheads | 26.6 | 15.6 |
| Disk Harrows | 8.0 | 5.0 |
| Field cultivators | 8.7 | 7.5 |
| Moldboard plows | 5.0 | - |
| Chisel plows | 9.0 | 5.3 |
| Balers, under 200 pound | -3.7 | -2.3 |
| Balers, 200 pound and over | 5.0 | 8.0 |
| Mower-conditioners | 3.9 | 2.5 |
| Forage Harvesters | 0.2 | 4.9 |
| Windrowers | 27.8 | 4.1 |
| Grinder mixers | 7.0 | 6.9 |
| Manure spreaders, box type | 1.5 | 2.0 |
| All farmstead equipment | 4.0 | n.a. |
| In-bin crop dryers | 5.0 | 5.0 |
| Batch and continuous flow dryers | 15.0 | 10.0 |
| Portable augers and elevators | 5.0 | 5.0 |
| Grain bins | 1.5 | 8.0 |
| Milking machines | - | - |
| Dairy and beef mechanization equipment | - | - |
| Hog mechanization equipment | 3.0 | 4.0 |

Source: Farm and Industrial Equipment Institute, State of the Industry, 1983 and 1984. Chicago, IL.

Western Europe: the EEC lowered farm commodity support prices during 1983. Farm machinery demand is consequently expected to decrease in 1984. For the quarter ending 30 April 1984, Massey-Ferguson reported European sales 27 per cent below last year's.[5/]

5/ Massey-Ferguson, First Quarter Report 1984, Toronto, Canada.

Australia: wheat and feed grain production in the 1982-1983 crop year decreased about 45 per cent, then doubled in 1983-1984. Sales of farm machinery in 1984 are expected to increase sharply, and are so far above the 1983 level.[6/]

Japan: there is a trend towards larger tractors but local manufacturers will gradually take the market away from imports.[7/]

Argentina: farm commodity exports are strong but currency controls will constrain farm machinery purchases.

Brazil: Brazil's Strategic Development Plan for the 1980s includes agricultural development. Although implementation of this plan will have a positive impact on farm machinery sales in the longer term, the balance-of-payments problem will dictate policy in the short-term. Thus, farm machinery sales in 1984 are likely to decline even further from 1983.[8/]

Mexico: government priority on agricultural development resulted in a significant improvement in the agricultural tractor market in 1981. But national debt problems severely limited farm machinery sales in 1982 and 1983, and they will continue to do so in 1984.

Other Latin America countries: in countries that nave escaped balance-of-payment problems the outlook for farm machinery sales is beginning to improve.

Iran: only ad hoc purchases (imports) of farm machinery and components can be expected at present.

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6/ Ibid.

7/ Massey-Ferguson, World Agricultural Outlook, Tononto, Canada, 10 December 1982.

8/ Ibid.

Turkey: the financial condition has improved somewhat and government processes have been stabilized. Agriculture will continue to receive favoured treatment. Farm machinery sales increased significantly in 1981 and 1982 but fell in 1983 and may again in 1984.

Pakistan: the financial condition will continue to limit the sales potential for agricultural tractors. Sales of domestically assembled tractor kits, however, appear to be strong.

South Africa: agricultural production is expected to recover to a relatively normal level in 1983-1984 but the national economy is suffering from inflation and decline in the gold price. Farm machinery sales in 1984 may rise 10 per cent based on the 1982 level.

Mid-East oil producing countries: this area is expected to remain a relatively strong market for agricultural tractors, but the current account surplus was sharply lower in 1982 and 1983 with most countries experiencing deficits. Little change is expected in 1984. Therefore, the level of sales will depend on government priorities and price competition will increase.

Other developing countries: the food demands of rapidly growing populations in other developing countries will result in continued efforts to increase local food production. Financial conditions deteriorated in 1982 but stable oil prices and stable to rising prices for raw materials prevented further deterioration in 1983. Farm machinery demand should remain near the 1982-1983 level.

## 3. GENERAL OVERVIEW OF THE WESTERN EUROPE AGRICULTURAL MACHINERY INDUSTRY

### 3.1 Data on the agricultural machinery sector

The crisis which hit the world tractor market (as well as the farm machinery market) in the mid-seventies, has continued into the present period, 1983-1984. Thus despite forecasts to the contrary in the early eighties, there has been no recovery. Sales have continued to fall, although at a slower rate than in 1980 and 1981. It would seem as if the tractor market had levelled off at around 1,200,000 units, including 130,000 units for the United States and Canada, 100,000 units for Japan, 270,000 units for Western Europe, 400,000 units for the centrally planned economies (excluding China) and 320,000 units for the developing countries.9/

Compared with 1976, which remains the reference year, the world market has experienced more than a 30 per cent drop. The hardest hit have been Japan and the European centrally planned economies, where tractor registrations have fallen by 50 per cent and 40 per cent respectively since 1976. The North American market has also shrunk by 40 per cent. This tendency emerged in 1974 and tended to become stabilized by 1980. This levelling off phenomenon has in fact taken place on all markets. In the developing countries where the drop in sales was lowest (-10 per cent) and in the centrally planned economies, this took place in 1979 and in Japan and Western Europe in 1981 (table 11 and figure 1).

The Western European market accounts for about 20 per cent of total tractor registrations, and about one third of the world market (excluding the centrally planned economies). It represents an important outlet for the major producers. This is all the more so since this market remains relatively stable and solvent. Faced with the sudden drop in sales between 1976 and 1981 (27 per cent), the constructors initially reacted by intensifying the conditions of competition in order to maintain their share of the market: reduced start-up prices, discount advantageous conditions of purchase of

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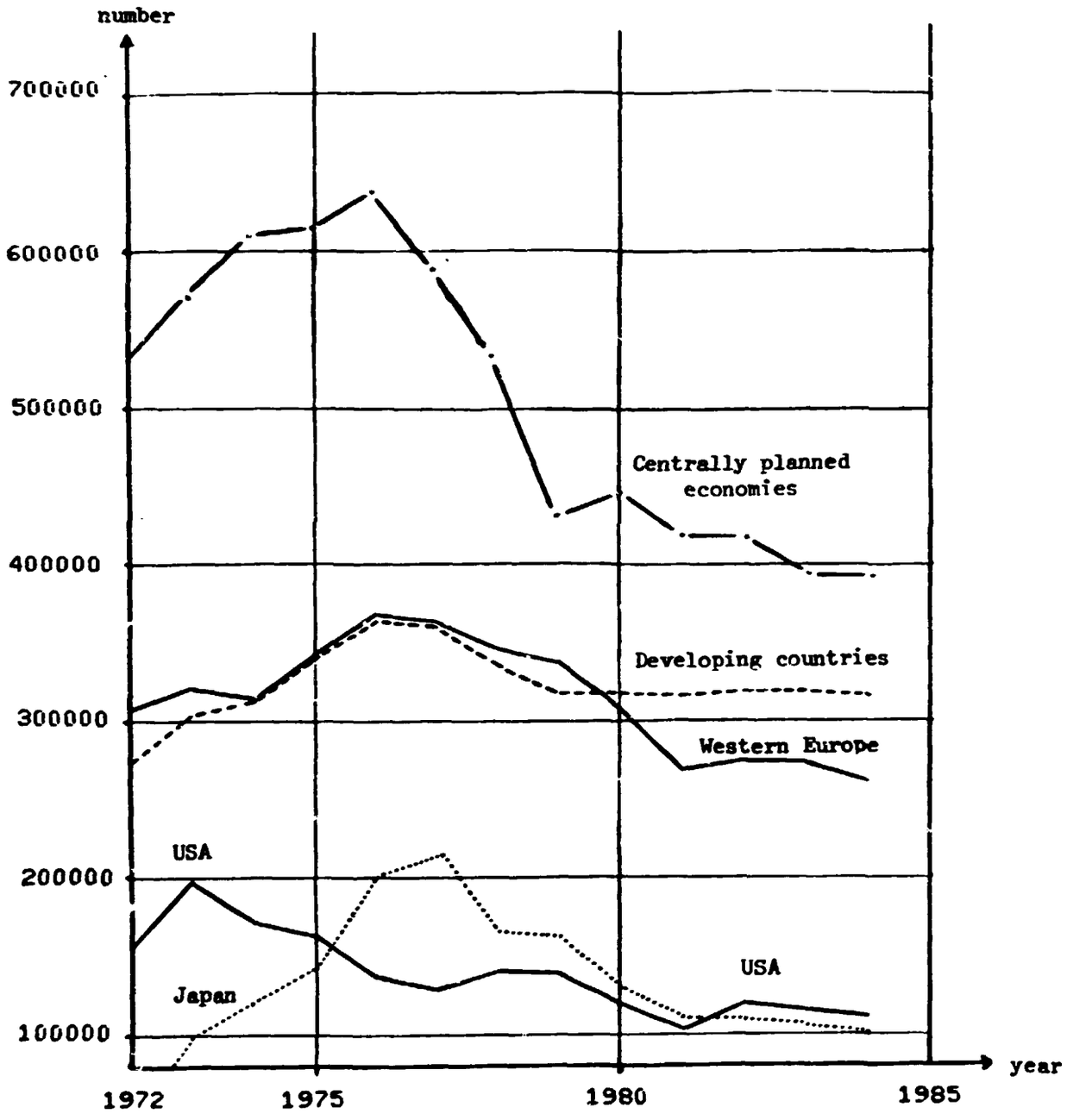
9/ This figure falls to 300,000 units if sales in Australia and South Africa are deducted.

Table 11. Tractors registrations by zone
(per cent)

| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Western Europe | 22.8 | 21.2 | 20.3 | 21.0 | 21.3 | 21.5 | 22.4 | 24.0 | 22.9 | 21.8 | 22.2 | 22.6 | 22.0 |
| USA/Canada | 13.3 | 14.8 | 13.0 | 11.8 | 9.8 | 9.4 | 10.9 | 12.0 | 11.0 | 10.3 | 11.0 | 11.0 | 11.0 |
| Centrally planned economies | 39.6 | 37.6 | 38.9 | 37.6 | 36.7 | 34.8 | 34.3 | 30.1 | 32.8 | 33.2 | 32.6 | 31.8 | 32.0 |
| Japan | 3.7 | 6.5 | 7.7 | 8.5 | 11.5 | 12.9 | 10.7 | 11.5 | 9.8 | 9.2 | 8.8 | 8.6 | 8.3 |
| Developing countries | 20.6 | 19.9 | 20.1 | 20.1 | 20.7 | 21.4 | 21.7 | 22.4 | 23.5 | 25.5 | 26.1 | 26.0 | 26.7 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Figure 1. Tractors registrations in the world



second-hand equipment, preferential financing and credit conditions, etc. This strategy seems to have been successful for those firms which had the means to implement it. Thus the penetration rate of Fiatagri in Europe rose from 10.9 per cent in 1976 to 12.4 per cent in 1979 and from 14.2 per cent in 1981 to 15 per cent in 1983; that of Same, which controls Lamborghini and Hürliman and is specialized in four-wheel drive tractors, rose from 5.4 per cent in 1979 to 8.6 per cent in 1982.

Competitors who had a strong home market at their disposal managed more or less to stabilize their positions: this is the case for Renault, Steyr, Deutz, Fendt and Valmet. The share of the market held by North American-owned transnationals, such as Massey-Ferguson, International Harvester and Ford has, on the other hand, substantially decreased. John Deere has resisted this trend because it produces top-range products and also because it is present on the harvesting machinery market (combined-harvesters, cutter-blowers, windrowers and pick-up balers).

The fact that this drop in sales, in terms of the number of tractors sold, is not reflected in real turnover figures is explained by a trend towards more sophisticated equipment, farmers preferring increasingly powerful and high-performance tractors.

## 3.2 International trade

The results registered by the various industrial groups are to be found in the foreign trade figures of the different European countries. Italy and the Federal Republic of Germany dispose of tractor industries which cover fairly well their home markets, with penetration rates of less than 20 per cent. Moreover, these two countries export a large part of their production - nearly 60 per cent. The main difference between them is that the Italian industry is strictly national in character, whereas German exports owe a great deal to the American manufacturers, John Deere and International Harvester.

The location of substantial industrial bases for North American transnationals (Ford, Massey-Ferguson, International Harvester) in Great Britain explains the high export/output ratio of British industry (more than 80 per cent), but this has not prevented a growing penetration of foreign, and particularly Italian firms.

The trends observed in Austria, decrease of export/out ratio and penetration rate, confirm the relative decline of Steyr on its own home market. The recent results of Finnish and Swedish industries reflect the fact that Valmet has specialized on certain export areas, and also that these economies are very open to imports: 97.5 per cent in Finland and 93.5 per cent in Sweden in 1983 (table 12).

The case of France is quite specific, and is characterized by equivalently high export and penetration rates - about 60 per cent - which show that the French industry has been unable to master its own market, and that foreign subsidiaries have been integrated in a system of exchange-flow of parts and sharing of different quality ranges - between units of production (tables 13 and 14).

The fall in sales on the various national markets has pushed small manufacturers into the war of prices, which has already been mentioned, on the export market. This has been the case for Fendt and Deutz who, because they were restricted by the crisis on the German market, have tried and succeeded in increasing their penetration rates on the most open markets, in particular the French one.

## 3.3 Structural changes in the agricultural machinery industry in Western European countries

The stabilization of the European tractor market is likely to provoke a change in the strategy of the big manufacturers, moving towards production on the basis of the positions acquired during the 1982-1984 period as to types and market shares. The most plausible scenario would be that the British market will be dominated by American Transnationals, their local plants exporting medium-range models (50-100 HP) towards the United States, Canada

Table 12. Penetration rate[a/] of the tractor market
(per cent)

| | 1981 | 1982 | 1983 |
|---|---|---|---|
| Germany Federal Rep. | 21.0 | 19.8 | 20.0 |
| France | 54.9 | 58.6 | 60.3 |
| Italy | 15.7 | 14.8 | 13.1 |
| United Kingdom | - | 39.9 | 47.9 |
| Austria | 51.6 | 43.6 | 40.2 |
| Spain | 27.6 | 44.6 | - |
| Finland | 78.8 | 86.2 | 97.5 |
| Sweden | 100.0 | 81.6 | 93.5 |

a/ Penetration rate i = imports/output + import - exports.

Source: Comité Européen des Groupements des Constructeurs du Machinisme Agricole (CEMA), Paris.

Table 13. Export rate[a/] of the tractor industry
(per cent)

| | 1981 | 1982 | 1983 |
|---|---|---|---|
| Germany Federal Rep. | 67.6 | 63.9 | 62.8 |
| France | 61.0 | 55.3 | 56.2 |
| Italy | 52.1 | 57.3 | 59.4 |
| United Kingdom | - | 82.5 | 82.7 |
| Austria | 55.5 | 40.7 | 26.3 |
| Spain | 27.3 | 57.5 | 42.3 |
| Finland | 21.2 | 45.4 | 91.7 |
| Sweden | 100.0 | 50.1 | 67.3 |

a/ Export rate $e = \frac{\text{exports}}{\text{output}}$

Source: Comité Européen des Groupements des Constructeurs du Machinisme Agricole (CEMA), Paris.

Table 14. Tractor data by country (units)

| | $US | | | Per cent | |
|---|---|---|---|---|---|
| | 1981 | 1982 | 1983 | 1981/82 | 1982/83 |
| **Production** | | | | | |
| Germany F.R. | 92,480 | 92,972 | 97,825 | 0.5 | 5.2 |
| France | 62,322 | 51,500 | 49,400 | -17.4 | -4.1 |
| Italy | 109,000 | 103,651 | 96,200 | -4.9 | -7.2 |
| United Kingdom | - | 90,133 | 94,560 | - | 4.9 |
| Austria | 10,328 | 9,936 | 10,634 | -3.8 | 7.0 |
| Spain | 22,764 | 16,092 | 15,820 | -29.3 | -1.7 |
| Finland | 3,226 | 2,571 | 2,518 | -20.3 | -2.1 |
| Sweden | 1,350 | 2,629 | 1,288 | 94.7 | -51.0 |
| **Exportations** | | | | | |
| Germany F.R. | 62,484 | 59,410 | 61,444 | -4.9 | 3.4 |
| France | 38,000 | 28,500 | 27,770 | -25.0 | -2.6 |
| Italy | 56,773 | 59,351 | 57,100 | 4.5 | -3.8 |
| United Kingdom | - | 74,342 | 78,222 | - | 5.2 |
| Austria | 5,736 | 4,047 | 2,792 | -29.4 | -31.0 |
| Spain | 6,219 | 9,247 | 6,687 | 48.7 | -27.7 |
| Finland | 685 | 1,168 | 2,309 | -99.8 | 97.7 |
| Sweden | 1,350 | 1,317 | 867 | -2.4 | -34.2 |
| **Importations** | | | | | |
| Germany F.R. | 7,982 | 8,298 | 9,075 | 4.0 | 9.4 |
| France | 29,594 | 32,559 | 32,852 | 10.0 | 0.9 |
| Italy | 9,746 | 7,675 | 5,880 | -21.2 | -23.4 |
| United Kingdom | 7,884 | 10,480 | 15,045 | 32.9 | 43.6 |
| Austria | 4,891 | 4,549 | 5,271 | -7.0 | 15.9 |
| Spain | 6,304 | 5,500 | - | -12.8 | - |
| Finland | 9,450 | 8,781 | 8,109 | -7.1 | -7.7 |
| Sweden | 5,161 | 5,833 | 6,104 | 13.0 | 4.6 |

Source: Comité Européen des Groupements des Constructeurs du Machinisme Agricole (CEMA), Paris.

and their other major exports markets. John Deere would then become completely specialized in the top range of tractors (more than 100 HP). The European constructors would maintain their dominant positions on their respective home markets, with competition operating fully for exports outside Western Europe. The low range productions (less than 50 HP) would be covered by production or marketing agreements with the major Japanese specialized manufactueres: Kubota, Yanmar, Iseki, Shibaura and Mitsubishi. These latter, who have been steadily increasing their production of medium-range tractors[10/], could upset this scenario from which they are excluded. Agreements, similar to those covering low range productions, might then be made between American or European constructors and theirs Japanese medium-range counterparts.

A European scenario for the sharing of markets and production ranges should also include the planned economies whose markets have become rapidly saturated, and thus have induced a dramatic fall in output. Their attempts to export towards the industrialized countries have ended in failure, despite attractive prices, mainly because of problems with design, marketing and after-sales networks.

It is possible to envisage agreements on technical assistance and provision of equipment from European manufacturers in order to modernize the range of models and the units of production in Belarus (USSR) or Zetor (Czechoslovakia).

This sales crisis affects all equipment. It is even more marked for combined-harvesters than for tractors and has become more acute since 1981: between 1976 and 1983 registrations dropped by 65 per cent in the United States and by 42 per cent in Europe.[11/] This development has been largely

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10/ Tractors of more than 50 HP accounted for only 10 per cent of total Japanese production in 1982.

11/ Between 1976 and 1983, sales of combined-harvesters fell from 33,000 to 12,000 units in the United States, and from 31,000 to 18,000 in Western Europe.

responsible for the worsening financial situation of the major specialized constructors, John Deere, International Harvester, Massey-Ferguson and Sperry New Holland. It is also the cause of the difficulties of the French constructor Braud: in 1980 end of combined-harvester production, then take-over by Fiatagri in 1983, which itself had been taken over by the Italian constructor Laverda in 1981.[12/] The crisis on the combined harvester market has thus already induced a major restructuring of the industry, which is likely to continue in as much as the major transnationals are all suffering from a great amount of over-capacity.

As far as the draught equipment is concerned, for which statistics are available, the trends are less clear-cut, although there is an almost generalized downward tendency over the medium-term. The transnationals and highly specialized smaller firms are engaged in a no-holds-barred competition, to such an extent that some spectacular withdrawals have been registered. Thus Fiat has withdrawn from the tillage equipment market. It should of course be mentioned that Fiat took this course of action in order to concentrate its efforts on grain harvesters (Laverda), forage harvesters (Hesston), and grape-harvesters (Braud). Massey-Ferguson, John Deere and International Harvester have given up the production of tillage, seeding, planting and fertilizer spreading equipment. Speery New Holland has consolidated its position on the market for top range pick-up balers and self-propelled cutter blowers. This is in fact one of the few remaining flourishing markets, along with those for seeding and high-precision spraying equipment. However, these are renewal markets, intended to substitute modern for old-fashioned equipment. Such markets will thus quickly become saturated. The only promising areas in the medium- and long-term are irrigation material, fixed equipment (greenhouses, transformation of farm buildings), and transport and handling equipment. As far as electronic devices for the automation of greenhouses, feeding systems in cattle husbandry, irrigation systems or farm management are concerned, this equipment does not come under the competence of the farm machinery industry, and as yet only involves very small quantities.

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12/ For the construction of the top range "axial flow" model.

### 3.4 Short-term outlook

It would be daring, to say the least, to forecast a forthcoming recovery of tractor and agricultural machinery sales in Western Europe. The most pessimistic of American experts consider that the crisis is structural in character and claim that it is unlikely that there will ever be a real recovery.[13/] Their European counterparts, although they are not really optimistic, are hoping for a lasting stabilization of the market, which could be transformed into a recovery at least in terms of turnover if a restructuring is intelligently organized. This would be the result of a continuing shift towards top-range equipment such as increase in average power and/or performance, increase in the share of four-wheel drive tractors, more sophisticated models, and would result in higher profits.

Nonetheless the conditions which were the root causes of this crisis, and its deep and lasting repercussions, are still present. The European market remains highly dependent on the agricultural environment and particularly for the member countries of the EEC on the Common Agricultural Policy. The extent to which tractor and farm machinery demand is sensitive to the restrictive measures of common agricultural policy is clearly illustrated by the recent examples of milk and grain policy. The setting up of milk production quotas[14/] by the member countries of the EEC and the threat to reduce tariff support for grain production in April 1984 certainly played a part in the drop in sales during the first half of the year.[15/] The restriction on the community's grain exports to the United States to 14 per cent of the volume sold on the world market has certainly dimmed the prospects of combined-harvester production. This is a paradoxical situation for France which registered in 1984 the harvest of the century in terms of tonnage brought in.

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13/ Financial Times, 5 September 1984. "The recovery that never came."

14/ By more than 33 per cent in West Germany, and by 13.6 per cent in Great Britain, over eight months, for example.

15/ Milk production is to decrease by 4 per cent in Europe over 1984-1985 period.

This situation can hardly be considered favourable if it is kept in mind that the obstacles to increased sales in Europe have still not been removed. The market for farm-machinery and equipment must still be seen overall as a renewal market. During a period of falling income, or expected falls in income, purchases are quite simply put off until a later date. Moreover, the fact that the average annual utilization time of tractors is decreasing (2,400 hours in 1962-1965; 600 hours in 1984), that farms are already highly equipped (11 different sorts of equipment for farms of over 100 hectares) enables farmers to carry on with their productive activities without new investment.16/

This situation in which the supply of machines is far in excess of demand has been exploited by certain distributors. Thus it has been increasingly observed that the only prices likely to remain stable are those of high technology equipment sold by networks of official agents. Other equipment in the lower range, on the other hand, has become the object of discount strategies, implemented by new distribution networks: the farm machinery supermarkets.

All European manufacturers have been affected by this trend since the small- and medium-sized farms, engaged in mixed-farming and animal husbandry, which are numerous in Europe, seemed to have given up the official agents in favour of the supermarket network.17/ This has led the agents and the constructors to rethink their marketing strategies.

The organization of distribution networks by the major tractor firms themselves, which was justifiable when sales were steadily increasing, is now being called into question. From now on such structures would only seem necessary for equipment with guaranteed prices and outlets. For all other

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16/ This evaluation was carried out for France by the Syndicat National de Distribution du Matériel Agricule (SEDIMA).

17/ Farms specializing in grain and industrial crops remain, in their great majority, faithful to the official network of concessionaries and their agents.

equipment, i.e. for low- or medium-range equipment which is now open to severe competition, after sale services (guarantee; repairs; spare parts and even technical advice and creidt facilities) are to be withdrawn.

These commercial strategies reveal in fact the deep-rooted differences of opinion among the major European tractor manufacturers.

Faced with the prospect of European demand levelling off from 1986-1987 at around 170,000 tractors sales, two options would now seem open:

(a) On the one hand, the manufacturers who are the least oriented towards the international market (Fendt; Deutz; Renault) will continue to privilege their home market, but on the basis of a range of high-price quality products. By voluntarily limiting their output to between 12,000 and 15,000 tractors a year, these constructors will be aiming above all at guaranteeing a market for their products, while steadily improving the technical performance of the equipment (monitoring; improvement of tractor-machine coupling; safety and comfort of driver's cabin);

(b) On the other hand, the constructors who are subsidiaries of transnational groups (Tenneco), of car companies (Fiat, Ford), or the specialized firms (Same) which have already opted for large-scale production (more than 40,000 tractors a year) will be willing to adapt to the constraints of the market in order to sell their products (price war; joint ventures; marketing agreements; technology transfers). Among such firms, process innovations likely to reduce manufacturing costs and therefore, to cut the prices of equipment, such as automation of assembly lines; robotization of machining operations; flexible workshops are stressed. This option is, therefore, in opposition to that chosen by the constructors who have mainly the European market in mind, and for whom innovation, which is product-oriented, is intended above all to renew periodically their range of products and their outlets.

These differences are reflected in the industrial and commercial strategies adopted by each group. It would thus be misleading to give an identical interpretation to facts which appear a priori to be comparable.

Thus, whereas threatened or actual factory closures decided by Massey-Ferguson[18/] serve to confirm that this firm has abandoned its former integration strategy, implemented over a long period, and has now decided to reduce its activities in the farm machinery industry. The industrial restructuring undertaken by International Harvester[19/] confirms the objectives of sticking adamantly to the same strategy, adopted by certain major constructors.

This option of retreating onto the most modern and high performance industrial base, in order to be able to respond to a demand which might be induced by the North American economic recovery and the exchange rate of the dollar,[20/] seems also to have been adopted by the major North American

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18/ Transfer or closure of the plant in Marquette-Lès-Lille (France), threatened closure of the plants in Aprilia (Italy), Cambridge (Canada), Bundaberg (Austria) and Racine (Wisconsin) which are respectively specialized in smelting, sugar cane machinery and spare parts. Grouping together of the centres in Eschwege (W. Germany) and Athis-Mons (France) and the British plants of Baginton and Coventry.

19/ International Harvester closed its factory in Croix (France) which was specialized in combined-harvester production, whereas it has kept open its factory in Angers (France) which mainly produces high capacity axial-flow combined harvesters intended for specialized grain farms. The installations in Angers are considered to be more efficient, and their products better adapted to the evolution of world market.

20/ The fact that the dollar has been maintained at a high level, and that North American manufacturing is specialized in very high power machines, undoubtedly encourages the exports of powerful but medium-range tractors to the United States. In the years to come there is bound to be a struggle for control of this important market between North American controlled plants located in Europe and Japanese manufacturers.

groups in Britain, Ford, Tenneco-Case[21], David Brown-John Deere.[22] All of these seem to have fared better in the economic crisis than their European counterparts, still hesitant when confronted with the social costs of industrial restructuring.

Present negotiations between Renault and International Harvester illustrate clearly the differences between strategies of industrial redeployment and those which aim at sharing out the European market among European manufacturers. Under pressure from the French authorities, who are looking for ways of setting up a French pole of farm machinery production and thereby saving jobs, the Renault group hopes to reappropriate the top range tractors and high technology components at present manufactured by the North American constructor. In the medium-term Renault sees this as a way of reinforcing its position on the European market, even if it has to give up the bottom and medium-range products, which are so successful on the export market,[23] to Southern European Constructors. International Harvester, which is at present benefitting from the recovery of sales of heavy-weight

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21/ Case has moved from the seventh to the third place on the North American market and is now aiming for second position. This company relies a great deal on Tenneco at a world level (the group has an annual turnover of 15 billion dollars), thus enabling it to engage in substantial investments.

22/ According to Mr. Lecompte, director of John Deere France "... it is the rise in exports which has lifted French output. Thus in 1983, the plant in Saran (France) was operating at 70 per cent of its production capacity of diesel engines, thanks to the North American market in particular. The plant in Arc-Lès-Gray (France) which has concentrated its activities on the production of haymaking equipment, after the closure of the Senonches factory, has launched new products which have opened new world markets. This plant exported nearly 3/4 of its output in 1983 to 30 different countries, whereas, overall, 50 per cent of the turnover of French factories is obtained on the North American market...".

23/ These orientations adopted by a certain number of European constructors could well slow down or counterbalance the attempts of Japanese manufacturers to find new markets for their low- and medium-range products (Kubota, Yanmar, Iseki, Shibaura among others).

machines on the North American market, is as yet unwilling to go ahead with this transfer, which might well endanger its expansion strategy on the markets of the industrialized countries.[24/]

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24/ After 18 months of negotiations Renault and International Harvester announced that they were to sign a co-operation agreement on 9 October 1984. Two joint companies have been set up. One will be specialized in studies and services and will establish the conditions and the timing of the co-operation efforts, the other is an investment company.

# 4. CONCLUSIONS

## 4.1 The North American agricultural machinery sector

The financial troubles of North American producers are not solely attributable to their particular markets, nor to the location of their production. World-wide demand for agricultural machinery has fallen for five years. The low demand is due primarily to below normal farm incomes caused by low agricultural commodity prices. The Payment in Kind (PIK) Programme in the United States helped raise some commodity prices, but also reduced planted acreage and therefore the physical need for farm machinery.

Manufacturers have generally responded to the world-wide sales decline by:

| | |
|---|---|
| - Closing factories | International Harvester |
| | Hesston |
| | Massey-Ferguson |
| | Sperry-New Holland |
| - Reorganizing divisions | International Harvester |
| | Sperry-New Holland |
| | Allis-Chalmers |
| - Selling subsidiaries | International Harvester |
| | Hesston |
| - Reducing inventory | All manufacturers |
| - Reducing employment | All manufacturers |
| - Suspending production at existing factories | All manufacturers |

Their overall goal has been to increase the efficiency of operations to allow break-even at a much lower level of production than before.

In 1984 the prospects are good for generally improved farm incomes. Commodity prices are substantially higher than last year's. With no PIK programme in 1984, planted acreage in the United States is much higher than in 1983. United States export sales to the Soviet Union are strong. Most agricultural equipment manufacturers forecast improved market conditions in 1984.

Several other exogenous factors have a more specific impact on North American producers:

(a) Strength of the United States dollar. The persistent strength of the United States dollar obviously handicaps United States exporters. North American manufacturers, however, have located subsidiary manufacturing plants in Europe and selected developing countries. Through offshore siting of manufacturing subsidiaries, the parent company can not only avoid adverse impacts from dollar revaluations, it can actually profit from them. To the extent that the offshore subsidiary exports machinery to the United States, a stronger dollar can increase profit margins on such exports.

(b) Currency restrictions. Weak demand for imports among industrial countries in 1981-1982, coupled with high interest payments on foreign borrowings has precipitated a balance of payments crisis among many developing countries. Some nations, particularly in Latin America, have instituted drastic restrictions on hard currencies, thereby sharply reducing imports, including those of agricultural machinery.

North American producers maintain strong ties to developing countries, especially in Latin America where they have several subsidiary or affiliated manufacturing facilities:

| | |
|---|---|
| Brazil: | John Deere, Massey-Ferguson, Sperry-New Holland, J.I. Case. |
| Mexico: | John Deere, Massey-Ferguson, (19 per cent owned), Allis-Chalmers (49 per cent owned), Ford. |
| Argentina: | John Deere, Massey-Ferguson (licensee). |
| Peru: | Massey-Ferguson (24 per cent owned). |
| Uruguay: | Massey-Ferguson (licensee). |

Because of depressed sales, however, some companies have de-emphasized their marketing efforts in developing countries. Massey-Ferguson maintains a Trade and Barter Division to arrange commodity exchanges in those countries with hard currency restrictions.

(c) High interest rates. In addition to contributing to balance of payment problems, in debtor countries high interest rates have made it more expensive for all purchasers to finance new agricultural machinery. In the United States, manufacturers have heavily subsidized financing terms to encourage purchases. Allis-Chalmers has recently sold their credit subsidiary to Security Pacific Bank, partly to take advantage of the Bank's lower cost of capital in financing sales. The United States Export-Import Bank does not offer concessionary loans to machinery purchasers and therefore, does not mitigate the problem of high interest rates.

(d) Japanese competition. Japanese machinery manufacturers have dominated the United States market for tractors under 40 HP, with a 90 per cent share of imports from 1981-1983. Meanwhile, United States manufacturers have stopped production of these small tractors. With their dominance of the domestic and United States markets for small tractors, the Japanese manufacturers are able to minimize production costs with high production runs. The Japanese, therefore, have a significant cost advantage in the small tractors marketed in many developing countries.

## 4.2 The Western European agricultural machinery sector

Two main trends have become apparent in the process of restructuring the European farm machinery industry over the last three years: consolidation of already acquired positions on the European market only, and industrial redeployment with an export drive in view.

On the one hand there is an attempt to constitute integrated industrial poles to meet a demand which can be precisely ascertained in terms of prices and quantities to be sold; on the other hand, the opposing strategy consists of occupying a place on all the world markets.

It may be estimated that although the initial industrial objective is not yet attained, agreements between European tractors and farm machinery manufacturers are presently aimed above all at satisfying the national requirements of a relatively solvent agriculture. This latter is looking for reliable products, with low maintenance and energy costs, which are

sufficiently complex to be labour-saving. Recent agreements between Fahr and Deutz in Germany, and Casalis and Renault in France are based on this type of logic of market stabilization.[25/] These orientations clash with those adopted by other major manufacturers. For these latter, technical and commercial agreements are to be used to consolidate their positions world-wide. Thus the emphasis is placed on extending distribution networks, multiplying products and occupying new areas on the market. This expansion drive on the world market is well illustrated by the agreements between Massey-Ferguson and the Danish harvesting machine producer Dronningborg, between International Harvester and Fahr for the production of medium-range combined harvesters, by the persistent rumours of a deal between Ford and new Holland, and by the across-the-board diversification strategy of Fiat in harvesting machines (increased participation in Laverda and Hesston - one of the world leaders in round-bale machines - take-over of Braud a major producer of grape-harvesters).[26/] From this point of view, Europe appears to be a preferential industrial base.

In such conditions, it is not difficult to understand why small- and medium-sized firms, specialized in one single product, are struggling to survive, even if there is a strong demand for their products. Volvo, which obtained a substantial share in the Finnish tractor manufacturer Valmet, has been forced to withdraw. The difficulties of European seeding and spraying equipment manufacturers, who had achieved a remarkable breakthrough on the export market between 1978 and 1982, but unfortunately on the basis of one single product, have since multiplied. The situation has deteriorated to such an extent that many of them are now trying to regroup (agreement between Caruelle and Nicolas concerning spraying apparatus), to sell out, or at least

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25/ The constitution of industrial poles which unite draught equipment and harvesting machines also correspond to market trends. In West Europe, the combined-harvester market has levelled off (17,000 units sold in 1983). In the field of pick-up balers, there has been an increase in round-bale machine sales (16,000 units sold in 1983, up 28 per cent on 1982) at the expense of conventional balers (22,000 units, down 15 per cent on 1982). As far as hay-making machines are concerned, there has been a clear increase of sales on the European market, despite a substantial fall in France.

26/ In this case, there is sub-contracting of the production of a range of combined-harvesters, intended to compete with models produced in Marquette.

to build on technico-economic agreements made with the majors in their field. There is no other way of explaining the growth in importance of Fiat in the farm machinery industry in Southern Europe.[27/]

All of the majors in the various farm machinery families are affected by these trends: be it New Holland, the co-leader alongside Claas in European combined-harvester production which is periodically on the lookout for partners in draught machines or new equipment:[28/] or, Fahr which has to rely on International Harvester and Deutz to ensure its outlets. Similarily, although British, Danish or German manufacturers of tilling equipment (rotavators) have stated their intention of dethroning the French or Italian conventional equipment manufacturers, they nonetheless have had to enter the distribution networks set-up by the high-tech manufacturers.[29/]

Despite their declining share in the overall turnover of their branch of industry, tractor manufacturers, now most often allied with harvesting equipment manufacturers, have never had such an influence among the European farm machinery industry as at the present time.

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27/ The Italians have made the most of the mechanization of farming in their country and of the biggest market in Europe: "This is a type of farm machinery which matches a highly diversified national agriculture, with all the soil varieties to be found in Europe. The producers are small and fiexible...", declare the managers of Fiat Trattori. The existence of this industrial network of dynamic and diversified small- and medium-sized firms has led Fiat to set-up a flexible and adaptable industrial cluster which is remarkably effective on the export market.

28/ According to official spokesmen, New Holland may well envisage the extension of its range of T.F. combined harvesters, both upwards and downwards. There has also been official talk of exploring new channels of production of other equipment. Claas, on the other hand, is wagering on increased harvesting machinery capacity, in its statement "... we are at present working on machines which will harvest 20,000 kilograms to the hectare".

29/ These high-tech manufacturers have maintained their sales with the help of four-wheel drive tractors. Moreover, it has been observed that the more sophisticated the equipment, the more buyers remain faithful customers of the official agents and their networks. Thus selling specialized high-tech equipment involves seeking support from an already established distribution network, since small firms cannot afford the costs of setting up and running such a network.

The only reservation to be made on this point concerns the fixed equipment used alongside heavy machinery in order to intensify special plant production (arboriculture, horticulture, floriculture), and indoor animal husbandry (poultry, pig and indoor cattle farming). With the exception of milk and poultry production, which are dominated by firms with ramifications through farm and food equipment,[30/] the production of this equipment (post harvesting and on the spot primary processing material equipment for stocking and preparation of inputs used for animal and plant production; buildings; greenhouses; irrigation equipment; automatic management systems for buildings or machines; material for equipping buildings for animals or greenhouses) is spread among a great number of small firms which have few technical or commercial links with each other. These markets which are as yet scattered and tight should develop rapidly in coming years with the new wave of intensification of plant and animal production. This trend should in turn be transferred to the farm machinery industry. If this is not done, industrialists who dominate today the tractor manufacture will have to face three basic changes. From the technical point of view, the heavy mechanical equipment will lose its leadership, benefitting much more complex bio-electronic systems, from an economic standpoint, tractor companies will no longer be of key importance in this branch and from a commercial point of view, this new demand for equipment should restimulate production.

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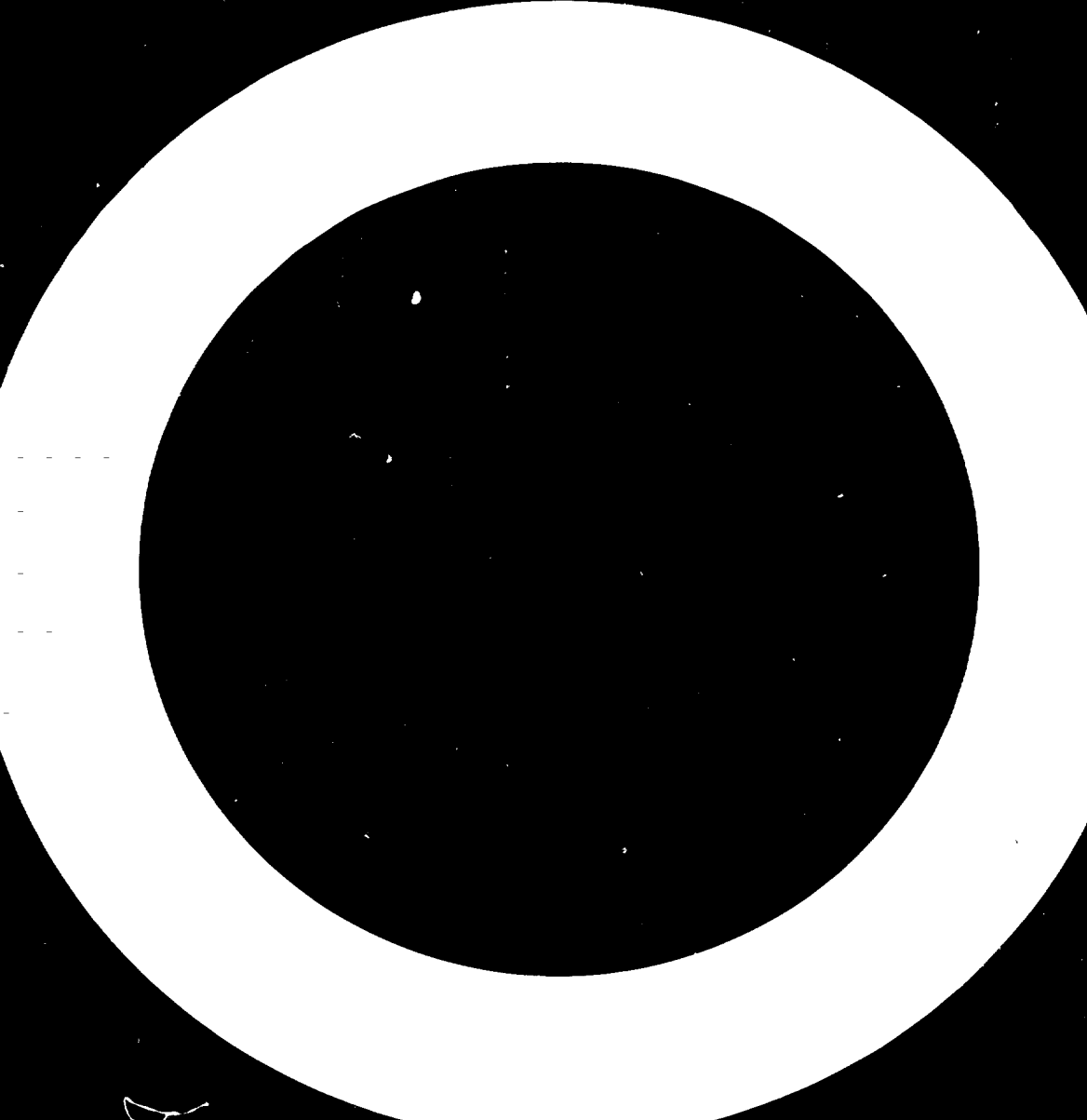
30/ It may be estimated, as far as this specialized equipment is concerned, that in reality four or five companies operating at an international level have shared out the market among themselves: Alfa Laval and Gascoigne in the dairy equipment market, for example.



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The present situation of the agricultural machinery industry in North America and Western Europe

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